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Filed : December 10, 2003

### REMARKS

By this paper, Claims 12 and 26 have been amended in order to comply with the Examiner's objection to the claims. No claims have been added. Thus Claims 1-27 remain pending and presented for examination.

#### I. Discussion of Rejection of Claims Under 35 U.S.C. § 103(a)

The Examiner has rejected Claims 1-12 and 14-26 under 35 U.S.C. § 103(a) as obvious over U.S. Patent No. 6,770,248 to Haggett, et al. ("Haggett") in view of U.S. Patent No. 5,380,411 to Schlieff. The Examiner has also rejected Claims 13 and 27 as obvious over Haggett in view of Schlieff, and further in view of U.S. Patent No. 6,447,720 to Horton III, et al. ("Horton").

In rejecting Claims 1-3, the Examiner has stated that Haggett "teaches a method of treating a cutting fluid (lubricating fluid; abstract) comprising exposing cutting fluid to ultrasound of a frequency of 100kHz or higher," but concedes that Haggett does not disclose exposing the cutting fluid to gas microbubbles. *Office Action*, at Page 2. The Examiner has not pointed to a particular portion of the Haggett reference that discloses the use of a frequency of 100kHz or higher. With respect to the Schlieff reference, the Examiner stated:

Schlieff teaches a process of treating liquid containing microorganisms, wherein the liquid is exposed to ultrasound in a preparation containing or producing microorganisms. It would have been obvious to someone of ordinary skill in the art at the time of the invention to provide a step of simultaneously exposing the cutting fluid to gas microbubbles and ultrasound of a frequency of 100kHz or higher in order to cause an intensification of the show wave or ultrasound effect (abstract of Schlieff). Schlieff further teaches wherein the gas microbubbles consist essentially of ambient air. Schlieff further teaches wherein the diameter of the microbubbles is less than about 50 micrometers. *O.A.*, at Pages 3-4.

With respect to Claims 4-12, and 14, the Examiner has stated that Haggett "teaches an apparatus for reducing the presence of live microorganisms in a cutting fluid comprising a compartment (3) for holding a reservoir of cutting fluid, an ultrasound emitter (1) configured to emit ultrasound signals at a frequency higher than 100kHz into the compartment," but concedes that Haggett does not disclose a microbubble emitter. *O.A.*, at Page 4. With respect to Schlieff, the Examiner states that "it would have been obvious to someone of ordinary skill in the art at the

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time of the invention to provide a gas microbubble emitter configured to emit gas microbubbles having an average diameter of less than 1mm into the ultrasound field in the compartment containing the cutting fluid in order to cause an intensification of the shock wave or ultrasound effect (abstract of Schlieff)." *O.A.*, at Page 4.

With respect to Claims 15-17, the Examiner has stated that Haggett "teaches a method of treating cutting fluid comprising collecting cutting fluid from a fluid routing circuit (figure 3), routing the cutting fluid into a compartment (40), and exposing cutting fluid to ultrasound of a frequency of 100 kHz or higher." *O.A.*, at Page 5.

With respect to Claims 18-26, the Examiner has stated that Haggett "teaches a machining system comprising a cutting device (not shown), a cutting fluid circuit connected to the cutting device, a compartment (40) for holding a reservoir of cutting fluid, an ultrasound emitter (1) configured to emit ultrasound frequencies at a frequency higher than 100 kHz into the compartment." *O.A.*, at Page 7.

The Examiner has also rejected Claims 1-12 and 14-26 under 35 U.S.C. § 103(a) as obvious over Haggett in view of "Bacterial Stress Responses to 1-Megahertz Pulsed Ultrasound in the Presence of Microbubbles," by Vollmer, et al., *Applied and Environmental Microbiology*, Vol 64, No 10, pages 3927-31 ("Vollmer"). The Examiner has also rejected Claims 13 and 27 as obvious over Haggett in view of Vollmer, and further in view of Horton.

The portions of the rejections dealing with Haggett and Horton are substantially similar to those already discussed above with respect to these claims. In rejecting Claims 1-12 and 14, the Examiner stated that Vollmer:

teaches a process of treating liquid containing microorganisms, wherein the liquid is exposed to ultrasound with gas microbubbles (page 3928, column 2, under "Ultrasound treatment"). It would have been obvious to someone of ordinary skill in the art at the time of the invention to provide a step of simultaneously exposing the cutting fluid to gas microbubbles and ultrasound of a frequency of 100 kHz or higher in order to provide a greater surface area for holding the cutting fluid and microorganisms (page 3930 first full paragraph, lines 8-13). *O.A.*, at Page 3.

Similar statements regarding Vollmer were made with respect to the rejections of the remaining claims.

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II. The Law of Obviousness

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. *In re Vaeck*, 947 F.2d 488 (Fed. Cir. 1991) Second, there must be a reasonable expectation of success. *Id.* Finally, the prior art reference (or references when combined) must teach or suggest all of the claim limitations. *Id.* The initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor has done. *See* M.P.E.P. § 706.02(j) If the reference does not suggest the claimed invention, the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. *Ex parte Clapp*, 227 U.S.P.Q. 972, 973 (Bd. Pat. App. & Inter. 1985).

III. Haggett Does Not Disclose Many Claim Elements, Nor Would It Have Been Obvious to Modify Haggett

Applicants submit that the Haggett reference does not teach a method or apparatus for treating cutting fluid. The Haggett reference makes a passing reference to a wide variety of fluids to which the process could be applicable, including shipboard fuels, ballast water, lubricating fluids, dairy products, pharmaceuticals and liquid food products and beverages. *Haggett*, Abstract. However, despite the broad list of potentially treatable fluids, the Haggett reference is directed almost exclusively to the treatment of fuels and ballast water. Indeed, the treatment of anything besides fuel and ballast or waste water is not discussed anywhere in the Haggett reference aside from the abstract. In addition, although cutting fluids are a subset of lubrication fluids, a cutting fluid is a very sensitive emulsion, whose parameters could be undesirably altered by the drastic treatment of Haggett. Thus, it would not have been obvious to use the Haggett process or apparatus to treat cutting fluid. In addition, Applicants respectfully submit that the Examiner has not pointed to any disclosure in the Haggett reference regarding a cutting device, nor can the Examiner point to such disclosure, as the Haggett reference is primarily directed to the decontamination of fuel and ballast water, and at no point in the reference discusses a cutting fluid or cutting device.

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Applicants also submit that the Examiner has not pointed to particular disclosure in the Haggett references which teaches the use of a ultrasonic frequency of 100kHz or higher. At best, Haggett states "The ultrasonic frequencies can range from 22kHz to 40kHz or higher." *Haggett*, col. 6, ll. 50-52. While the Haggett reference does therefore state that a higher frequency than 40 kHz may be used, the disclosed frequency range in Haggett is only 18kHz wide, and the claimed frequency range of 100 kHz is greater than the upper end of that range by more than three times the size of the disclosed range. Furthermore, the power amplifier of Haggett was only capable of providing a signal response up to 70kHz. *Haggett*, col. 6, ll. 37-38 and 43-44. Thus, Applicant respectfully submits that Haggett does not disclose the use of an ultrasonic frequency of 100kHz or higher.

Furthermore, Applicant respectfully submits that it would not be obvious to modify the Haggett device to output ultrasound at a frequency of 100kHz or higher. The Haggett device relies on the mechanical action of the applied ultrasound energy to produce cavitation, and the power output of the Haggett power amplifier "is 300W at 15kHz tapering to 32W at 59kHz." *Haggett*, col. 6, ll. 44-46. Thus, if the Haggett device were to output ultrasound at a frequency higher than 59kHz, the power output would be further reduced, preventing the cavitation effects on which the Haggett process relies.

#### IV It Would Not Have Been Obvious to Combine Haggett With Either Shlief or Vollmer.

With respect to the Schlieff reference, Applicants respectfully submit that the method and apparatus of Schlieff differs from the claimed methods and apparatuses in that the method of Schlieff requires a preparation in order to ensure microbubble stability. *See, e.g.*, Abstract, col. 1 ll. 35-37, ll. The method of Schlieff is never discussed with respect to simple gas microbubbles, such as the bubbles which may be produced by the microbubble emitter, but instead only discusses the use of coalescent-resistant microbubbles which comprise a surface membrane as a result of the preparation. The enhancement of the cavitation effect in Schlieff is due to this surface membrane, which permits the bubbles to remain uncoalesced, permitting treatment over a long period of time.

Similarly, Applicants respectfully submit that the Vollmer method, like the Schlieff method, relies on the use of stabilized microbubbles. *See, e.g., Vollmer*, page 3928, col. 2, 3<sup>rd</sup>

paragraph ("Two types of microbubble cavitation nuclei were used: Albunex, a commercially available agent ... consisting of protein-encapsulated air bubbles, and ST66, a research agent ... consisting of surfactant-coated air bubbles"). Without the use of stabilized microbubbles, ordinary microbubbles would coalesce rapidly under the high-frequency, high-power conditions disclosed in Vollmer, greatly reducing the efficiency of the method.

Thus, it would not have been obvious to one having ordinary skill in the art to apply the method or apparatus of Schlieff or Vollmer to the system of Haggett, which only requires short bubble residence times. In addition, the materials required to stabilize the microbubbles in the Schlieff and Vollmer methods may have undesirable chemical effects on a cutting fluid, particularly if introduced to the cutting fluid in conjunction with the drastic cavitation treatment of Haggett.

In contrast, the methods and apparatuses claimed in the present application have surprisingly resulted in the desired biocidal effect without the modification of the intrinsic characteristics of cutting fluid compositions which could come about as a result of the combination of the Haggett reference with the Schlieff or Vollmer references.

Thus, Applicants submit that a person having ordinary skill in the art would not have had a motivation to combine Haggett with either Vollmer or Schlieff. Applicants submit that a skilled artisan would have avoided the combination of the drastic treatment of Haggett with the introduction of the stabilizing materials of Vollmer and Schlieff in the treatment of a cutting fluid.

Applicants also submit that the Horton reference cited by the Examiner with respect to Claims 13 and 27 does not cure the deficiencies in the Haggett and Schlieff or Haggett and Vollmer combinations, which do not render any of the present claims obvious.

#### IV. Conclusion

Applicants respectfully submit that Haggett does not disclose the treatment of a cutting fluid, nor does it disclose a cutting device. Applicants further submit that not only does Haggett not disclose the application of ultrasound at a frequency of 100 kHz or higher, it also not have been obvious to modify the device of Haggett to emit ultrasound at such a frequency, as doing so would have reduced or eliminated the cavitation effect upon which Haggett relies.

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Furthermore, it would not have been obvious to combine Haggett with either Vollmer or Schlieff, as both references require the use of stabilization materials which could be detrimental to the cutting fluid to be treated, particularly when introduced during the harsh treatment of Haggett.

Thus, Applicants respectfully submit that Claims 1-12 and 14-26 are not obvious in light of Haggett in view of Schlieff for at least the reasons discussed above, nor are Claims 13 and 27 are obvious in light Haggett in view of Schlieff and further in view of Horton, as they depend from independent Claims 4 and 18, respectively.

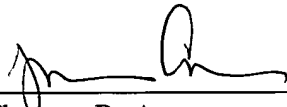
Therefore, Applicants respectfully submit that pending Claims 1-27 are in condition for allowance, and respectfully request withdrawal of the current rejections and objections, and request allowance of Claims 1-27.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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AMEND

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